

# MARSHALL STAR

Serving the Marshall Space Flight Center Community

July 11, 2002

## NASA, Marshall Center breaks ground for advanced propulsion research lab

by Rick Smith

**T**he Marshall Center broke ground Monday on a state-of-the-art research facility intended to revolutionize 21st century space propulsion, help power future space vehicles on journeys to the farthest reaches of the solar system — and, eventually, beyond it.

The Propulsion Research Laboratory will be housed on a 21-acre site on Redstone Arsenal. It will be occupied primarily by propulsion scientists and technologists from the Marshall Center's existing Propulsion Research Center.

"This world-class facility sets the stage for propulsion research that will utterly revolutionize space travel as we know it," said Marshall Center Director Art Stephenson, who shared earth-turning

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Artist rendering of the Propulsion Research Laboratory

## Air-breathing engine rockets past key milestone

*Unique design functions as rocket, ramjet and scramjet*

by Rick Smith

**I**nitial design of a new prototype air-breathing rocket engine for NASA — one that could revolutionize air and space travel in the next 40 years — reached a major milestone ahead of schedule last week.

The engine's design team, the Rocket Based Combined Cycle Consortium, completed its first major engine systems requirements review — an exhaustive examination of the engine's design and performance parameters — three months earlier than originally planned.

To design the radical new engine, the consortium combines the propulsion development skills of the Rocketdyne Propulsion

& Power business unit of The Boeing Co., of Canoga Park, Calif.; the Pratt & Whitney space propulsion business unit of United Technologies Corp., of West Palm Beach, Fla.; and the Aerojet missile and space propulsion business unit of GenCorp Inc. of Sacramento, Calif.

The flight-like ground test engine is being developed as part of NASA's Integrated System Test of an Air-breathing Rocket (ISTAR) program, which intends by the end of the decade to flight-test a self-powered vehicle to more than six times the speed of sound, demonstrating all modes of engine operation.

Dubbed "ARGO" by its design team, the engine is named for

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# Propulsion

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duties at the ceremony with U.S. Sen. Richard Shelby of Alabama, U.S. Rep. Bud Cramer of Alabama's 5th Congressional District and Denny Kross, director of Marshall's Space Transportation Directorate.

"Scientific exploration of our solar system and the galaxy beyond can no longer afford to be delayed by the limitations of conventional propulsion technologies," Stephenson added.

"Today, we turn over the first sods of earth for construction," said Dr. Stephen L. Rodgers, manager of the Propulsion Research Center. "In very short order, we will turn over the conventions of modern space travel as we know it, and rewrite the textbook on how future deep-space missions are flown."

The 108,000-square-foot facility will provide office and laboratory space for propulsion research and small-scale experiments supporting cheaper, more efficient and safer access to space. Studies will be conducted in a number of fields, including solar energy, advanced chemical propulsion technologies, and processes based on fission, fusion and antimatter. Construction is expected to be completed in April 2004.



Helping break ground for the new Propulsion Research Laboratory are, from left, Marshall Director Art Stephenson, U.S. Sen. Richard Shelby, U.S. Rep. Bud Cramer and Denny Kross, director of Marshall's Space Transportation Directorate.

The facility's site was a natural choice, Rodgers said, given the Marshall Center's existing, world-class, propulsion-study resources, as well as Marshall's partnership with the National Space Science and Technology Center. The NSSTC, a Huntsville-based clearinghouse for cutting-edge space science and propulsion research, was founded by the Marshall Center, along with local, state and national university partners and other federal agencies. It has been in operation since

2001.

For more information about the new Propulsion Research Laboratory, visit: <http://www1.msfc.nasa.gov/NEWS-ROOM/background/facts/prl.pdf>

For more information about NASA's space transportation and propulsion research, visit: <http://www.spacetransportation.com> and <http://www.slinews.com>

*The writer, employed by ASRI, supports the Media Relations Department.*

## ***NASA extends Reusable Solid Rocket Motor contract with ATK Thiokol***

*Marshall news release*

**N**ASA has extended to May 2007 its six-and-a-half-year \$2.4 billion contract with ATK Thiokol Propulsion in Brigham City, Utah, for the production and refurbishment of 70 Reusable Solid Rocket Motors for the Space Shuttle Program.

Under the modified contract, Thiokol will produce and refurbish 35 Reusable Solid Rocket Motor flight sets (70 motors) and three flight support motors. The modification adds \$429 million to the contract.

The contract, issued in October 1998, is the sixth in a series of contracts for the design, development, production and refurbishment of Solid Rocket Motors for the Space Shuttle Program and represents a continuing relationship between the Marshall Center and Thiokol. Marshall is home to the Space Shuttle's Reusable Solid Rocket Motor Project Office.

At launch, the three Space Shuttle Main Engines and the two Reusable Solid Rocket Motors provide enough thrust to lift the

4.5-million-pound shuttle vehicle — the propellant weighs 3.5 million pounds — into orbit.

The Shuttle's Reusable Solid Rocket Motor is the largest solid motor ever flown and the first designed for reuse. Each motor consists of four segments lined with 1.1 million pounds of solid fuel propellant. The forward segment holds an igniter.

Two motors, each producing an average thrust of 2.6 million pounds during their 124-second burn, are used on each Space Shuttle flight. At burnout the Shuttle has reached an altitude of 24 nautical miles and a velocity of more than 3,000 mph. After the propellant is depleted, the Solid Rocket Boosters, which house the motors, separate from the Shuttle's orbiter and land in the ocean.

The Solid Rocket Boosters are recovered and disassembled and the motors are returned to Thiokol. At Thiokol, the cases are cleaned, inspected and reassembled for propellant casting, and a new nozzle and igniter are installed. The motor's steel case components can be used as many as 20 times.

# Ion engine and technology development teams selected

## Marshall Center to administer new contract awards

Marshall news release

**N**ASA's Office of Space Science in Washington has announced the selection of a team for the development of an advanced ion propulsion system — an alternative to conventional chemical propulsion that could revolutionize the way we send science missions into the solar system.

A second team was selected to develop advanced ion optics, which are critical components of ion engines.

The agency's Glenn Research Center in Cleveland was selected to lead development of the NASA Evolutionary Xenon Thruster (NEXT) system, which will use xenon gas and electrical power to drive future spacecraft. Additionally, a team led by Boeing Electron Dynamic Devices Inc. of Torrance, Calif., was selected to pursue development, fabrication and testing of carbon-based ion optics, critical components of high-power ion thrusters that have traditionally limited thruster lifetime.

"The NEXT ion engine is an exciting next step in ion propulsion and will enhance a whole host of ambitious new space science missions," said Carol Carroll, In-Space Propulsion (ISP) Program Executive in the Office of Space Science at NASA Headquarters, Washington.

The NEXT Project is a proposed two-part endeavor. The first phase is a one-year effort to design, build and test initial versions of ion thrusters, propellant feed systems and power processing units, which convert solar array power into forms useful for the ion engine. At the end of Phase 1, NASA may exercise a Phase 2 option to complete hardware development and integrate components into a full-scale system.

The total potential value of the Glenn award over the next three and one-half years is approximately \$21 million. The total value of the Boeing team award is approximately \$4 million. Total NASA funding for NEXT system development activities is approximately \$27 million.

Ion propulsion systems convert electrical power and xenon propellant into high-speed ion flows that accelerate spacecraft with fuel efficiencies about ten times higher than conventional chemical propulsion.

"Technologies such as ion propulsion are key to enabling shorter mission times and could reduce costs for future space missions, which permits a greater focus on space science," said Les Johnson, In-Space Propulsion manager for NASA's Advanced Space Transportation Program at the Marshall Center.

The Marshall Center will administer both new awards.

An ion thruster converts electrical power and xenon gas into a high-velocity flow of positively charged ions. Metal grids that exert an electrostatic force accelerate these ions, much the same way bits of lint are pulled to a statically charged comb, but with a dramatically different effect. The accelerated ions leave the thruster at speeds of up to 89,000 mph, propelling the spacecraft forward. The result: fuel efficiency that exceeds conventional chemical engines by as much as a factor of 10.

The new ion thruster development program builds on the success of the Deep Space 1 mission, a NASA probe launched in 1998 to validate advanced flight technologies. Deep Space 1 was powered by an ion thruster just 12 inches in diameter, which accelerated the spacecraft to a velocity of 7,900 mph over a 20-month period.

Deep Space 1 made history during its close fly-by of Comet Borrelly in September 2001, when it returned the clearest images and best scientific data ever gathered about a comet. Its success was a first step in the exploitation of high-power ion propulsion for a broad class of future space missions, including possible planetary visits. The NEXT ion engine will be capable of carrying significantly more payload and have a

longer lifetime than the Deep Space 1 ion engine.

The In-Space Propulsion Program seeks to develop advanced propulsion technologies that can enable or greatly enhance near and mid-term NASA science missions by significantly reducing cost, mass, and/or travel times.

The In-Space Propulsion Program is managed by the Office of Space Science at NASA Headquarters and is implemented by the Marshall Center. The program is supported by NASA's Ames Research Center in Moffett Field, Calif.; Glenn Research Center, NASA's Jet Propulsion Laboratory in Pasadena, Calif., NASA's Johnson Space Center in Houston and NASA's Langley Research Center in Hampton, Va.

NASA partners with cutting-edge industry leaders, the nation's academic institutions and other government agencies to realize its ambitious in-space propulsion goals.



Courtesy photo

### **Who am I?**

I was born in Limestone County. I am a twin that married a twin. I have two children. That's me on the left in my father's arms in 1933. To find out who I am, see page 10.

# Wellness Center officially opens for Marshall team

**R**ibbon-cutting ceremonies took place June 27 officially opening the Wellness Center, Bldg. 4315, at the Marshall Center.

Among the center's new features are state-of-the-art exercise equipment, 44 pieces of cardio equipment including 15 treadmills, air conditioning and new wood floors for the racquetball and basketball courts. The Weight Room's square footage has more than doubled in both floor space and equipment.

Marshall employees and contractors also can participate in aerobics classes, yoga, kick boxing and other activities.



Photo by Dennis Olive, NASA/Marshall Center

Setting the example to get in shape by lifting this "dumbbell," are, from left, Jim Carter, deputy director of the Center Operations Directorate, Marshall Center Director Art Stephenson, Tereasa Washington, director of the Customer and Employee Relations Directorate, and Marshall Associate Director Axel Roth.



Photo by Dennis Olive, NASA/Marshall Center

This Marshall team member is already putting the Wellness Center to good use.



Photo by Dennis Olive, NASA/Marshall Center

Katherine Harris, left, gives Jane Thomas a free back massage.



Photo by Terry Leibold, NASA/Marshall Center

Wellness Center staff members are, from left, Bill Mayo, Lana Hart, Amanda Pittman, Tim Reynolds and Heather Day.

# Red Cross Bone Marrow Drive July 19

By Nancy Jane Fitzgerald

The Madison County Chapter of the American Red Cross will host its first Bone Marrow Drive in conjunction with the Marshall Center's Blood Drive on Friday, July 19 from 8 a.m.–1:30 p.m.

Blood donors will have the opportunity to participate in the Bone Marrow Drive. Typical testing usually costs \$600. Through community matching funds, the American Red Cross usually offers these tests for \$21. The National Marrow Foundation will offer the first 100 non-minority donors testing at no charge.

Congressional funding allows minority donors to also receive the testing at no charge. The minority population continues to be grossly underrepresented on the National Registry.

For those wishing to participate in the drive, a Red Cross staff member will be available to screen potential bone marrow donors. Once accepted, the staff will take one test tube of blood — the equivalent of two tablespoons — to perform a bone

marrow test. The test can be run simultaneously during blood donation.

Once a donor has been tested, the Histocompatibility Typing (HLA) is placed on the National Registry until the donor turns 61 years old. If at any time the donor is identified as a match, donors will be contacted by the Donor Center for further testing.

For further information about bone marrow donation, go to the National Marrow Donor Program Web site at [www.marrow.org](http://www.marrow.org).

For more information about the Marshall Center's Blood Drive or Bone Marrow Drive, call Nancy Jane Fitzgerald at 544-7561.

Blood donors will receive a free American Red Cross T-shirt, free medium one-topping Domino's pizza coupon and a free Chick-Fil-A sandwich coupon.

*The writer works in Marshall's Human Resources Department.*

## Medical Center walk-in clinic operations for civil service employees

*From the Management Support Office*

Many employees continue to have questions about what services they can expect to receive when visiting the Marshall Medical Center clinic.

The Medical Center primarily performs mandatory physical examinations for work-related potential exposures. Secondary operations include voluntary physical examinations and clinic operations. The goals in having the clinic operation are to relieve suffering, keep employees on-the-job when they have minor injuries and illnesses, and to enhance the overall work environment for employees.

The Medical Center's staff is reclarifying its role because some patients have come to rely too heavily on the resources of the Medical Center.

The Medical Center should not be used for:

- injuries from home that require X-rays and/or crutches;
- when employees are ill at home for one or several days, they should not come to work to visit the Medical Center.
- gynecological problems, such as yeast infections, which usually should be cultured, which is beyond the on-site lab capability.
- for requesting prescriptions for

routine medications such as blood pressure or cholesterol-lowering medications, antidepressants and allergy medications, as this potentially interferes with a private physician's plan of treatment and some medications require routine monitoring of blood work.

- for patients completing a regime of medication without improvement and requesting treatment, this also is potentially interfering with the private physician's plan of action.

- for chronic or repeated urinary tract infections; medical protocol states that repeated infections require further testing such as culturing.

Patients should feel free to come to the Medical Center for all work-related illnesses and injuries. All medical emergency calls, whether walk-ins or calls to 911, are handled by the clinic and/or paramedics, as a matter of course.

Patients who develop symptoms during the workday are welcome to come to the clinic. The Medical Center is chartered to provide initial evaluation and treatment and provide prescriptions, as appropriate, for events such as headaches, colds, heartburn, seasonal allergy symptoms (not chronic), pulled/stiff muscles, joint pain, a cut or scratch that is becoming infected or a patient fears may be infected – basically,

minor health concerns.

Some examples of medications routinely on-hand at the clinic are aspirin, ibuprofen, antihistamines, decongestants, topical antibiotic/antifungal/ cortisone/ burn ointments, cough syrup/lozenges, antibiotics, muscle relaxers, antacids, nitroglycerin and eye/ear drops.

All Marshall team members are advised and encouraged to get a private physician if they do not already have one. Your health is too important to not make plans to assure your care during "un-healthy or crisis" periods.

While the annual examination employees receive at the Medical Center is quite thorough, it still does not encompass all health concerns and should only be considered a supplement to the care and communication employees have with their private physicians.

### Energy Tip

Photovoltaics offer consumers the ability to generate electricity directly from sunlight. Photovoltaics also are called solar cells. The word photovoltaic comes from "photo," meaning light, and "voltaic," which refers to producing electricity. Photovoltaic lighting is used at the Wellness Center, Bldg. 4315, parking lot.

# Engine

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the mythological Greek ship that bore Jason and the Argonauts on their epic voyage of discovery. The team believes the name appropriate because the ship's technological marvels were surpassed only by the world-class prowess of its crew.

ARGO's unique engine design allows it to function as a rocket, ramjet and scramjet. Key among its technical advantages: the ability to use air as an oxidizer. Compared to conventionally powered rocket vehicles, this technology will significantly reduce vehicle weight by eliminating a significant amount of its required on-board oxidizer.

The ISTAR contract calls for completion of conceptual system design and subsystem testing by November 2002. Ground testing of the flight-weight, fuel-cooled engine flow path is scheduled to begin in 2006.

"This review is a big step toward our goal four years down the road," said Consortium Program Director Mike McKeon. "We are now on our way to

ground testing the world's first hypersonic, rocket-based, combined cycle engine — fueled and cooled by hydrocarbon and high-test peroxide propellants."

The project is funded by NASA as part of an effort to make future space transportation safer, more reliable and significantly less expensive than today's missions.

"Air-breathing propulsion is one of the most promising concepts we've seen for reaching NASA's future-generation spaceflight goals," said Steve Cook, deputy manager of the Advanced Space Transportation Program at the Marshall Center. "The successful completion of this critical first milestone bears out NASA's faith in this team to lead America to a revolutionary new age in global and out-of-this-world transportation."

The innovative air-breathing rocket engine for the operational vehicle would get its initial power boost from specially designed rockets in a duct that captures air, an arrangement that improves performance about 15 percent above conventional rockets. Once the vehicle has

accelerated to more than twice the speed of sound, the rockets are turned off and the engine relies solely on oxygen in the atmosphere to burn its hydrogen fuel. When the vehicle has accelerated to more than 10 times the speed of sound, the engine converts to a conventional rocket-powered system to propel the craft into orbit.

Spacecraft powered by air-breathing — or rocket-based, combined cycle — rocket engines would be completely reusable, able to take off and land at airport runways, and ready to fly again within days.

Air-breathing propulsion is a concept dating to the 1960s.

The Marshall Center — which began pursuing the technology for space-based applications in 1996, and started testing air-breathing rocket engine components in 1997 — manages the ISTAR program for NASA.

*The writer, employed by ASRI, supports the Media Relations Department.*

## Five Marshall team members take home AIAA awards

Five Marshall team members received honors at the American Institute of Aeronautics and Astronautics Alabama-Mississippi Section awards dinner in May.

Also recognized as new AIAA Fellows were Marshall Center Director Art Stephenson and Dr. Ann Whitaker, director of Marshall's Science Directorate.

Robert Sackheim, Marshall assistant director and chief engineer for space propulsion, won the Herman Oberth Award. The award is for outstanding individual scientific achievement in the fields of astronautics and space sciences or for the promotion and advancement of the aeronautical sciences.



Sackheim

Paul S. Gill, ED41, won the Holger Toftoy Award, which is presented to a member of the Section to recognize outstanding technical management in aeronautics and astronautics.

Dr. Charles A. Smith, UP10, won the Aerospace Engineer of the Year Award. The award recognizes an individual who has demonstrated extraordinary technical skill and leadership in the aerospace engineering profession.

Paul L. Luz, SD42, was pre-



Gill



Smith

sented the Young Engineer of the Year Award. It is presented to recognize an individual 35 years old or younger who has demonstrated extraordinary technical skill and dedication in the aerospace engineering profession.

Donald W. Monell, UP10, took home the Software Engineer of the Year Award for demonstrating extraordinary technical skill, creativity or leadership in development of software supporting significant aerospace programs or the industry.



Luz



Monell

# Materials Science Conference brings in the experts

Scientists and experts from across the nation came together at NASA's Materials Science Conference during the last week of June at the Von Braun Center in Huntsville.

Hot topics were materials for advanced spaceships, radiation shielding, studying materials on Mars and biomaterials used in medicine.

The conference was sponsored by the Office of Biological and Physical Research and hosted by the Marshall Center and NASA's Materials Science Discipline Group.



Photos by Terry Leibold, NASA/Marshall Center

A mock-up of an International Space Station module features materials science research racks.



Brian Morris, left, and John Santiago examine a science rack.



Angela Shields, left, and Christy Hales at the conference.



Reviewing information on the Quench Module Insert System are, from left, Shawn Breeding, Jeff Armer, Fred Kroeger, Bernie Groome, Monica Hammond and Robert Olson.

# 'Quiet' star not quiet after all

by Sherrie Super

For more than two years the star was “quiet.” Or so scientists thought. But the X-ray pulsar EXO 2030+375 was abuzz with activity. Scientists simply lacked the ability to “hear” it over the hum of a nearby black hole.

Pulsars are tiny rapidly rotating neutron stars — the material left over after normal stars burn out and collapse under their own gravity, until just a sugar cube-sized piece can weigh as much as 200,000 elephants.

A study by scientists at the National Space Science and Technology Center in Huntsville, the University of Southampton in England and the University of Valencia in Spain, offers new insight into the EXO 2030+375 star system, particularly during a period of 32 months, from August 1993 to April 1996, when it appeared to be inactive.

This type of pulsar studied, a transient accreting X-ray pulsar, orbits a massive star eight to 15 times the mass of our Sun, with a distinctive signature — optical emission lines caused by glowing material blown off the star into a disk around its equator.

“The nearby black hole, Cygnus X-1, makes a lot of noise,” said Dr. Colleen A. Wilson-Hodge, a NASA astrophysicist at the NSSTC. “If this black hole were in the frequency range where we could hear it, it would hum.”

This “humming” of the black hole, scientists now believe, was loud enough to give the false impression that the X-ray pulsar EXO 2030+375 was inactive. But thanks to a new technique developed by Wilson-Hodge and fellow NSSTC researcher Dr. Mark Finger, they now believe it was as active as ever.

The new technique analyzes existing data, but uses different mathematical equations to compensate for the hum of the nearby black hole.

The researchers used data from a special device — the Burst and Transient Source Experiment, or BATSE. BATSE was designed to observe gamma rays, a powerful form of energy invisible to the naked eye and undetectable by most telescopes that — unlike BATSE — “see” only visible light.

This instrument was mounted on NASA’s Compton Gamma Ray Observatory, which orbited Earth from 1991 to 2000. Unlike many telescopes that monitor cosmic objects one at a time, BATSE had a wider range, observing the entire sky for nearly a decade, what Wilson-Hodge believes was a key factor in making the surprise discovery.

“After we accounted for the hum of Cygnus X-1, we realized



Photo by Doug Stofer, NASA/Marshall Center

## Seeing the science of Marshall

U.S. Rep. Dr. Dave Weldon of Florida, left, examines the Microgravity Science Glovebox as Marshall’s Richard Grugel explains how it will enable more experiments to be conducted aboard the International Space Station. Weldon is a member of the U.S. House of Representatives Science Committee and vice chairman of the Space and Aeronautics Subcommittee. He toured the Marshall Center last week.

the pulsar was active during this time frame after all,” said Wilson-Hodge. “The signal was merely fainter, as we can now observe using the new techniques.”

Correlating the gamma ray observations with optical and infrared observations taken by Dr. Malcolm Coe of the University of Southampton and Dr. Juan Fabregat of the University of Valencia in Spain showed the researchers why the pulsar became fainter -- the disk of material around the companion star became less dense, giving the pulsar less material to consume.

In addition to discovering the pulsar wasn’t “quiet” during those 32 months, the research led to another discovery about the star system. “For the first time ever, we’ve been able to observe a wave of density in gamma-rays,” Wilson-Hodge said.

Density waves — compression waves, like sound, that travel through cosmic objects and cause a collection of gas -- have been observed in the optical wavelength, but never in the X-ray wavelength, until now.

Optical observations of emission lines from hydrogen also show evidence for a density wave in EXO2030+375. As this density wave moves throughout the disk of material around the companion star, the optical emission lines change shape and the X-ray activity occurs at a different place in the orbit.

These new techniques have the potential to unlock secrets of other star systems. “With every advance — whether in how we obtain the data, or how we analyze the data — we obtain yet another piece of the cosmic puzzle,” Wilson-Hodge said. “Every breakthrough brings us that much closer to understanding star activity across the universe.”

*The writer, employed by ASRI, supports the Media Relations Department.*

## Author, historian Dr. Stephen Waring enjoying summer at Marshall researching new book

by Katie Graham

About 50 teachers from across the country are working at the Marshall Center through the Summer Faculty Fellowship Program. The program offers teachers a chance to get more involved with Marshall and NASA.

One of the program's participants this year is Dr. Stephen Waring, a history professor at the University of Alabama in Huntsville. He co-authored "Power to Explore: A History of Marshall Space Flight Center 1960-1990." During his summer at Marshall, Waring is studying and writing a book about the Space Shuttle Challenger accident.

"Marshall has great archives, which makes my work easier," Waring said. "When I'm writing and run into gaps, I have access to people and documents to fill in the gaps."

A lot of Waring's book will be about

what happened after the accident.

"Challenger has rich documentation – before and after," Waring said. "The material is very complex."

Added Waring: "Many people are attracted to the story of Challenger, not because it's so complicated, but people can remember where they were when that happened. People rarely see a tragedy happen before their eyes."

Waring said many important lessons were learned from the Challenger explosion. "The major lesson that the engineers learned was to test, test, test – that you could never know too much about your technology. You can't take anything for granted in aerospace research."

Waring said his time in Marshall's archives is invaluable. "There are new things that I haven't looked at before. Working at Marshall has been fun. I have a dozen chapters in my outline and I'm satisfied with my progress."



Photo by Emmett Given, NASA/Marshall Center

Waring at work in Marshall's history archives.

*The writer is a student volunteer at the Marshall Center this summer. She will be a junior in the fall at Sparkman High School in Harvest.*

## Student-polished space mirrors ready for launch

Marshall news release

Students from hundreds of schools in 43 countries smoothed and polished approximately 1,000 mirrors to make them reflective for the Starshine 4 – a space-bound satellite which, when ready for launch, will resemble a high-tech disco ball.

After the students' work, the mirrors were then coated by Marshall's Space Optics Manufacturing Technology Center to prevent their reflective surfaces from tarnishing in the harsh environment of space.

The mirror-covered satellite is set for launch in January 2003 on the Space Shuttle Atlantis during the STS-114 mission to the International Space Station. Orbiting the Earth for several years, Starshine 4 will reflect sunlight to observers on the ground, so that students participating in the educational program can study the effect of solar activity on Earth's atmosphere.

This satellite is the fourth in a series. The first Starshine satellite orbited the Earth from June 1999 until February 2000. Starshine 2 orbited the Earth from December 2001 until April 2002. Starshine 3, launched in September 2001, is still in orbit.



Photo by Emmett Given, NASA/Marshall Center

Marshall optical physicist Vince Huegele inspects some 800 of roughly 1,000 mirrors ready for assembly onto Starshine 4.

# Obituaries

**Crutcher, Twoneria "Winnie" Moore, 45**, of Huntsville, died June 29. She was a contract employee for Infinity at the Marshall Center.

The funeral was Wednesday, July 3, at Indian Creek Primitive Baptist Church with Elder Timothy Rainey officiating. Burial was in the adjoining church cemetery.

She was a member of Indian Creek Baptist Church where she served as church clerk and usher and sang in the choir.

She is survived by her husband, David Crutcher; one daughter, Tralonda Crutcher of Huntsville; her parents, Willie B. and Lucille Moore of Huntsville; and three sisters, Charian Drake of Harvest and Karen Moore and Bridgett Moore, both of Huntsville.

**Duncan, Christine S., 82**, of Gadsden, died June 28. She retired from the Marshall Center in 1980 as a public information specialist.

**Hamlet, John F., 69**, of Huntsville, died June 11. He retired from the Marshall Center in 1988 where he worked in the I&E Systems Laboratory.

He is survived by his wife, Carolyn S. Hamlet.

**Owens, John E., 83**, of Huntsville, died June 24. He retired from the Marshall Center in 1980 as an engineering technician.

Burial was in Maple Hill Cemetery.

He was a native of Armory, Miss., and a U.S. Navy veteran of World War II.

He is survived by two sons, Robert Glenn Owens and Luke Michael Owens, both of Huntsville; and one brother, Walton Owens of Mississippi.

**Riddick, Edwin L., 79**, of Huntsville, died July 1. He retired from the Marshall Center in 1994 as supervisor of employee relations and DVMT specialist in the Employee Services and Development Office.

Burial was at Cameron Cemetery with Bill Stone officiating.

During his time in the protocol office, he worked closely with Dr. Wernher von Braun, the Marshall Center's first director. He taught farm safety classes at Standard Oil, was a U.S. Army veteran and enjoyed fishing. He was the widower of Gloria Anne Goodwin Riddick.

He is survived by his wife, June Ray Cope Riddick; one son, Mark Edwin Riddick of Huntsville; one daughter, Dama M. Riddick of Huntsville; two stepsons, Jimmy Cope and Jeffery Cope, both of Huntsville; one brother, Frank Riddick of Huntsville; two sisters, Miriam R. Dendy and Minnie Francis R. Nash, both of Huntsville; one grandchild; two stepgrandchildren; and three great-stepgrandchildren.

**Williams, James R., 76**, of Huntsville, died June 21. He retired from the Marshall Center in 1990 where he worked as a supervisor, AST, aerospace engineer.

Burial with full military honors was in Valhalla Memory Gardens with the Rev. Lynn Dimon officiating.

He was a U.S. Navy veteran of World War II, a member of the Bee Keepers Association and a member of Lakewood United Methodist Church. He had a bachelor's degree in mechanical engineering.

He is survived by his wife, Margo K. Williams; two sons, Gregory L. Williams of Huntsville and Jeffrey A. Williams of Denver; and one sister, Mary Jo Haugo of Minnesota.

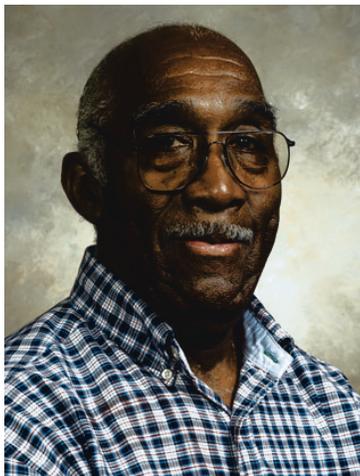


Photo by Dennis Olive, NASA/Marshall Center

## Who am I?

**Richard Fletcher is a truck driver for Cortez III at Marshall. He has worked at the Center for 39 years. When time permits, Fletcher enjoys gardening and is active in his church.**

## Job announcements

**MS02D0056**, AST, Technical Resources Management. GS-801-07/09/11, Space Shuttle Projects Office. No closing date.

**MS02C0171**, AST, Reliability & Quality Assurance. GS-0861-14, Safety & Mission Assurance Department, Cargo Assurance Department. Closes July 11.

## International Project Management 18 course space still available

Space is still available for the International Project Management 18 (IPM 18) course on Aug. 18-23, in Washington, D.C. The cutoff date for registration is July 31, 2002. For more information about the course and the APPL/NET nomination form, go to:

<http://appl.nasa.gov/managers/schoolhouse/ipm.htm>

Civil Servants who are interested in attending this course should download and complete the nomination form and send it to CD20/Jerry Miller by July 31, 2002.

For more information, contact Tina Smith at 544-7834.

# Center Announcements

## University scholarships available

Two university scholarships sponsored by the Marshall Association are available for incoming freshmen in September. Both technical and non-technical scholarships will be awarded. The Association will accept applications for the scholarships until July 31. Completed applications should be submitted to Cliff Bailey in AD01 or call 544-5482.

## Thrift Savings Plan open for Marshall employees

Marshall employees can change their contributions to Thrift Savings Plan accounts until July 31. Employees also may begin contributions to their accounts during this period. There are five different funds to choose from. For more information, call Ginger Martin at 544-5654 or Debbie Allen at 544-7536.

## Marshall Retirees Association offering university scholarship

Students who are descendants of a Marshall Center retiree can apply for the NASA-MSFC Retirees Association Scholarship at the University of Alabama in Huntsville. The \$1,000 scholarship will be awarded for the academic year beginning in the fall. For more information, call UAH Student Financial Services at 824-2755.

## NASA Performance Evaluation Profile Survey required

All Marshall team members, civil service and contractor, are required to complete the Performance Evaluation Profile Survey. A training module is at the Safety, Health and Environmental Web site. The training module can be completed in about one hour. For assistance, or for more information, call Dennis Davis at 544-8628, or Kristie French at 544-7474.

## Did you once race a moonbuggy?

Planning for the 10th annual Great Moonbuggy Race, to be held in 2003, has begun. Organizers would like to find any Marshall team members who once

raced on a moonbuggy team. For more information, call Durlean Bradford at 544-5920.

## WebTADS training notice

NASA Administrator Sean O'Keefe has requested that time keeping be delegated to the employee level. Training is now available to Marshall employees on WebTADS timesheet entry and NASA standardized policies. The WebTADS training team will be contacting the administrative officer or management support assistant of each organization to coordinate training dates and location. The training sessions will last approximately two hours and will include timekeeping standardized policies and a WebTADS system navigation demonstration. Labs will be available as needed for additional practice. Administrative officers or management support assistants should call Pam Vaughn at 544-9372 for additional information.

## AdminSTAR employee overview training dates set for July

The AdminSTAR employee overview training is designed to provide users with the core functionality of AdminSTAR learning management software application. Users will be able to identify methods to overcome AdminSTAR log-on barriers, use catalog and calendar features, review and print requested and approved training as well as cancel out of approved courses. All sessions will be in Bldg. 4200, Room G13A, on July 9 from 1-2 p.m. and 2:30-3:30 p.m.; July 24 from 1-2 p.m. and 2:30-3:30 p.m.; and July 25 from 1-2 p.m. and 2:30-3:30 p.m. To register, call John Heath at 544-2622.

## Marshall picnic Aug. 17

The Marshall Center's annual picnic, "Family Fun Day 2002," will be from 10 a.m.-2 p.m. Activities will be held at the Marshall picnic area with a children's parade beginning at 9:45 a.m.

## AIAA 50th anniversary dinner

The American Institute of Aeronautics and Astronautics Alabama-Mississippi Section is celebrating its 50th anniversary with a dinner and panel discussion. The meeting is at 5:30 p.m. July 25 at the Huntsville Marriott. Regular admission is \$20 and student admission is \$10. Reservation deadline is July 22. For more information, call Arloe Mayne at 881-7124 or Wanda Reece at 544-2630. The meeting is open to the public.

## MARS tennis club to hold tournament

The MARS tennis club will hold an open doubles tournament on July 13. Warm-up starts at 8 a.m. with the tournament starting at 8:30 a.m. Teams can be man/woman, two men or two women. MTC members may invite a guest to play as their partner -- fee is \$3 per guest. To register, call Ronda Moyers at 544-6809.

## Procurement retreat is July 18

The Procurement Office will hold an all-hands retreat from 8:30 a.m.-3:30 p.m. on July 18 at Ditto Landing Marina. The office will be closed on this date.

## Engineering Directorate awards celebration set July 17

The Engineering Directorate awards celebration will be July 17 at the Marshall picnic area. For more information, call Pravin Aggarwal at 544-5345.

## MARS ballroom dance lessons

Waltz and Mambo dance lessons will be July 15, 22 and 29 in the Parish Hall off St. Stephens Episcopal Church. Fee is \$8 per lesson. Intermediate lessons are from 7-8 p.m. and beginners from 8-9 p.m. Call 650-0200 for more information.

## Retired federal employees meeting

The National Association of Retired Federal Employees will meet at 9:30 a.m. Saturday at the Senior Center on Drake Avenue. For more information, call 881-4944 or 881-3168.

# Employee Ads

## Miscellaneous

- ★ Babylock Esante ESE2 embroidery/ sewing machine, 3-sizes embroidery hoops, software & embroidery cards, \$2,800. 722-8004
- ★ Waterbed, single, semi-waveless mattress, heater, padded side rails, \$100 obo. 837-0996
- ★ Sectional sofa, 3-piece, cream colored, 19' long, \$400 obo. 722-8004 after 6 p.m.
- ★ Sears Proform treadmill, variable speed & inclination, digital readout, upper body exerciser. \$199. 682-5181
- ★ Oak office desk with hutch, \$175. 859-0796
- ★ Faberware, 8 settings w/serving pieces, Dorchester pattern, small chip on one cup, \$40. 256-464-6678
- ★ CONN alto saxophone, Model 21M, includes hard case, cleaning accessories, & reeds, \$750 obo. 882-1779
- ★ Yamaha Clavinova, CVP-85A, \$1,500. 772-6725
- ★ Single waterbed, honey maple w/brass trim includes heater, comforter and bedding, \$120. 859-0729
- ★ Sony 5-disk changer, tuner, dual cassette, amp, 10' towers, cabinet, \$450. 961-4942
- ★ 1989 YX 250, new tires, o-ring chain, \$400; Minn-Kota trolling motor, 4-speed, \$50. 325-6000
- ★ Wet tile saw, Model MK-470, \$240; other tile laying accessories, \$25. 714-3495
- ★ Whirlpool self-cleaning electric oven/ range, \$150; side-by-side refrigerator w/ice in door, \$225; white. 536-4507
- ★ Chrome tubular step bars, (nerf bars),

- for extended cab Chevrolet pickup, \$150. 837-5270
- ★ RCA Pro-Wonder video camcorder w/ pro-edit, zoom lens w/Micro, solid state MOS image sensor, best offer. 256-772-6469/683-6469
- ★ Exercise bike, variable resistance, ergometer knob missing, \$50 firm; Bogan photo enlarger, \$50 firm. 883-2869
- ★ Junior golf clubs, 7-piece Palmer, left hand set, \$40. 379-2020
- ★ Boat, 14' w/trailer, new tires, rims, troller, 55HP Johnson motor, needs carburetor work, \$600. 721-4534
- ★ Hippo 8 degree driver, \$100. 506-3236
- ★ Two side-by-side crypts, eye level, Valhalla Memory Gardens. 239-272-5627/498-0332

## Vehicles

- ★ 1992 Saab 900S, green, 40door, 143K miles, leather, new brakes, \$2,700. 325-0855
- ★ 1972 Class A Boise motorhome, 36K miles, automatic, Kohler generator, Dodge 413 engine, \$3,500. 881-9150
- ★ 1997 Cadillac Catera, loaded, 75K miles, well maintained, \$8,900. 256-725-7783
- ★ 1977 Chevrolet parts truck, long wheelbase, bed, 6-cyl. motor/transmission intact, \$500. 379-2933 from 3-8 p.m.
- ★ 2001 Dodge Intrepid, 6K miles, \$16,500. 828-4251
- ★ 1998 Dodge Grand Caravan, \$8,500. 233-6197
- ★ 2001 Nissan Pathfinder SE, V6, burgundy, Bose CD, factory warranty, 26.3K miles, \$22,500. 837-4524

- ★ 1999 Chrysler 300M, platinum/leather/gray, chrome wheels, sunroof, 31K miles, cassette/CD, \$17,900. 256-881-0976

## Free

- ★ Puppies to good home. 931-469-5536
- ★ Strawberry plants, large berries, good variety, any number, pickup July 1-Sept. 30, 2002. 256-9165
- ★ Round tub, 4-1/2' diameter, beige, fiberglass, a few nicks. 971-1414\*

## Found

- ★ Glasses in Pearle Vision case, found in Marshall taxi. 544-8294

## Wanted

- ★ 100<sup>th</sup> Shuttle Flight bookmark. Please? Will pay reasonable price. Wanted for gift. 306-0700 Decatur
- ★ Computer, older model, 75-300MHz, do not need monitor. 883-2757
- ★ Intuit Alabama State Income Tax Software for 2001. 509-0196
- ★ Automobile booster seat for 5-yr. old. 890-0755
- ★ Church pews in good condition for newly remodeled church building. 232-9552
- ★ Open hole flute in good shape w/ without case. 828-5840

# MARSHALL STAR

Vol. 42/No. 43

Marshall Space Flight Center, Alabama 35812  
(256) 544-0030  
<http://www1.msfc.nasa.gov>

The Marshall Star is published every Thursday by the Internal Relations and Communications Department at the George C. Marshall Space Flight Center, National Aeronautics and Space Administration. Contributions should be submitted no later than Monday noon to the Marshall Internal Relations and Communications Department (CD40), Bldg. 4200, room 101. Submissions should be written legibly and include the originator's name. Send electronic mail submissions to: [intercom@msfc.nasa.gov](mailto:intercom@msfc.nasa.gov) The Marshall Star does not publish commercial advertising of any kind.

Manager of Internal Relations  
and Communications — Steven Durham  
Editor — Jonathan Baggs

U.S. Government Printing Office 2002-733-060-60011

Permit No. G-27  
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